# Emergency Preparedness for Clinicians - From Guidelines to the Front Line

## Clinician Outreach and Communication Activity (COCA) Webinar

## March 26, 2015

Office of Public Health Preparedness and Response
Division of Strategic National Stockpile

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# Objectives

## At the conclusion of this session, the participant will be able to:

- Outline the five main levels of disaster preparedness and response from the American College of Chest Physicians' Guidelines for Care of the Critically Ill and Injured during Pandemics and Disasters
- Discuss the importance of pediatric emergency preparedness for both pediatric and non-pediatric providers
- Identify key lessons learned from the recent Ebola outbreak for improving emergency preparedness in North American
- Describe ways clinicians and public health practitioners can collaborate to respond to disasters and pandemics

# TODAY'S PRESENTER

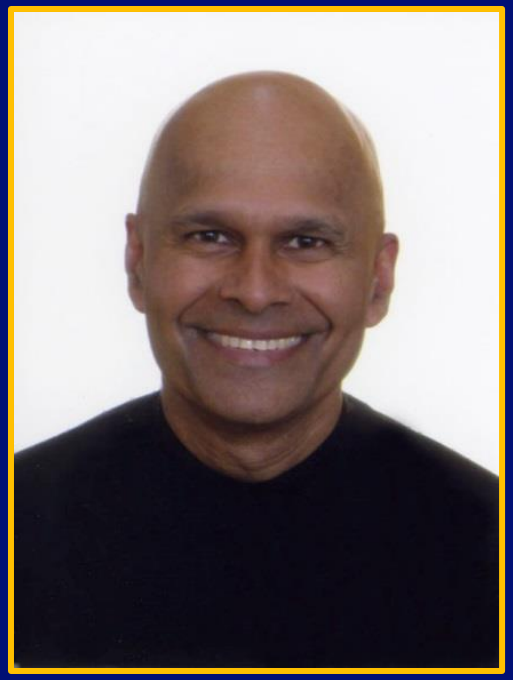
**Michael D. Christian, MD, MSc**

Chief Safety Officer

Vice Chair, Disaster Network

Niagara Health System

# TODAY'S PRESENTER



**Niranjan (Tex) Kissoon, MD, FRCPC, FAAP, MCCM, FACPE**
Vice President, Medical Affairs
BC Children's Hospital
Professor, Pediatric and Surgery
University of British Columbia

# TODAY'S PRESENTER

**Lewis Rubinson, MD, PhD, FCCP**

Associate Professor

University of Maryland School of Medicine

Director of the Critical Care Resuscitation Unit

R Adams Cowley Shock Trauma Center

# TODAY'S PRESENTER

**Timothy Uyeki, MD, MPH, MPP**

Chief Medical Officer

Influenza Division

National Center for Immunization and Respiratory Diseases

Clinical Team Lead - CDC Ebola Response

# Emergency Preparedness for Clinicians - From Guidelines to the Front Line

**Maj Mike Christian MD, MSc (Public Health), FRCPC**

**The Task Force For Mass Critical Care**

# Disclosures

- No financial conflicts, no off label products

- *The opinions expressed within this manuscript are solely those of the author (MDC) and do not represent the official position or policy of the Royal Canadian Medical Service, Canadian Armed Forces or the Department of National*
- *The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry*

# FUNDING/SUPPORT

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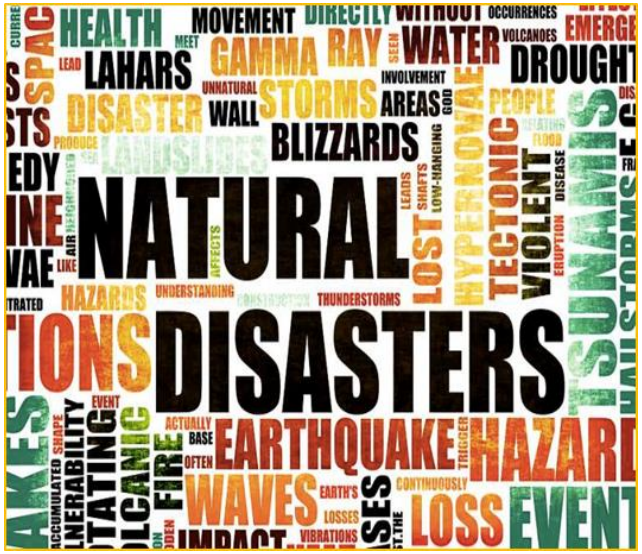
# Disasters




**The challenge…**

High quality evidence is lacking, but..

People need guidance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**Chest. 2014;146(4_suppl):1S-41S, e1S-e177S**

[ Evidence-Based Medicine ]

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# Introduction and Executive Summary

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Michael D. Christian, MD, FRCPC, FCCP; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; Lewis Rubinson, MD, PhD; and Niranjan Kissoon, MBBS, FRCPC; on behalf of the Task Force for Mass Critical Care*

PODCAST


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Chest. 2014;146(4_suppl):35S-41S

[ Evidence-Based Medicine ]

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# Methodology

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Joe Ornelas, MS; Jeffrey R. Dichter, MD; Asha V. Devereaux, MD, MPH, FCCP; Niranjan Kissoon, MBBS, FRCPC; Alicia Livinski, MA, MPH; and Michael D. Christian, MD, FRCPC, FCCP; on behalf of the Task Force for Mass Critical Care*

# Task Force Participants

- 100 participants
- From 9 countries
  - 14 content experts
  - 68 panelists
  - 18 topic editors Clinicians/experts from wide variety of disciplines
- Critical Care, Surgery, Trauma, Burn, Pulmonary Medicine, Internal Medicine, Military Medicine, Disaster Medicine, Infectious Diseases, Hospital Medicine, Ethics, Law, Public Health
- Diverse professions (MD, RN, RRT, Pharm, MPH, Admin, etc)
- Adult and pediatric populations
- 15 different professional societies and organizations
- Extensive Literature Review
- PICO & Delphi Methods

# List of Reviewers

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- Curtis Sessler, MD, FCCP–President-Elect
- Barbara A. Phillips, MD, MSPH, FCCP – President-Designate
- Carcy D. Marciniuk, MD, FCCP – Immediate Past President
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- **Palliative and End-of-Life Care Network**
  - Nineka O. Mokwunye, Phd, MA, FCCP
  - Harvey Reich, MD, FCCP
- **CHEST Journal – Independent external peer reviewers**

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**Disaster Response Network**

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- Derek S. Wheelr, MD, FCCP
- Alan Roth, RRT, MS, MBA

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# Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

- Twelve manuscripts
- 267 suggestions
- 177 pages
- **FREE on line !**

# Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

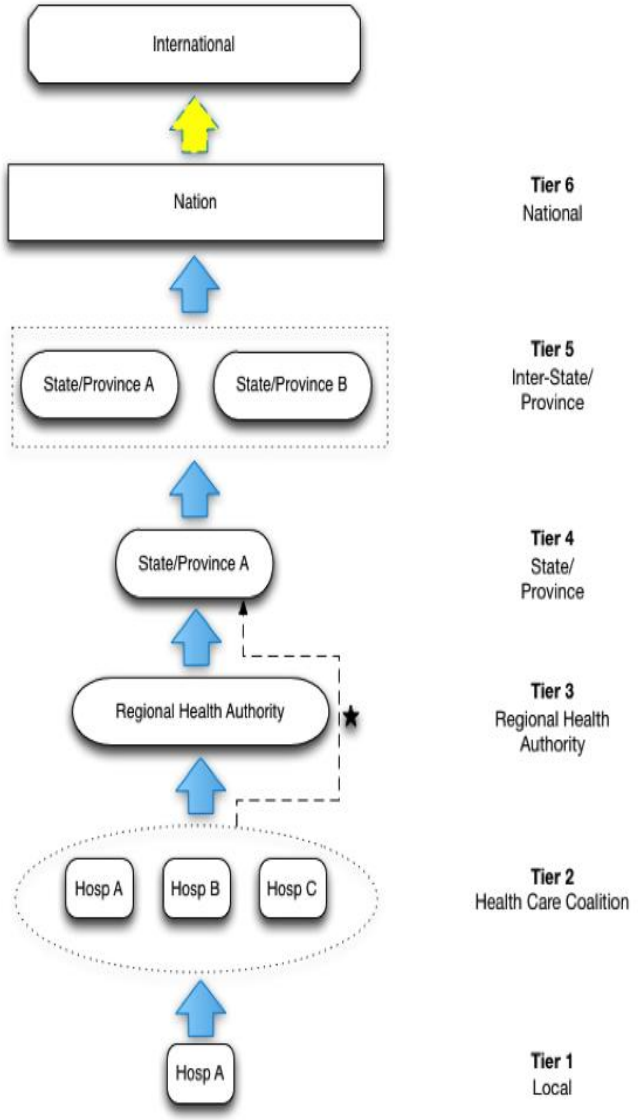
Endorsed by:

- American Association of Critical-Care Nurses
- American Association for Respiratory Care
- American College of Surgeons Committee on Trauma
- International Society of Nephrology
- Society for Academic Emergency Medicine
- Society of Critical Care Medicine
- Society of Hospital Medicine
- World Federation of Pediatric Intensive and Critical Care Societies
- World Federation of Societies of Intensive and Critical Care Medicine

# Surge Capacity Principles

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*John L. Hick, MD; Sharon Einav, MD; Dan Hanfling, MD; Niranjan Kissoon, MBBS, FRCPC; Jeffrey R. Dichter, MD; Asha V. Devereaux, MD, MPH, FCCP; and Michael D. Christian, MD, FRCPC, FCCP; on behalf of the Task Force for Mass Critical Care*

# Surge Capacity Principles

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

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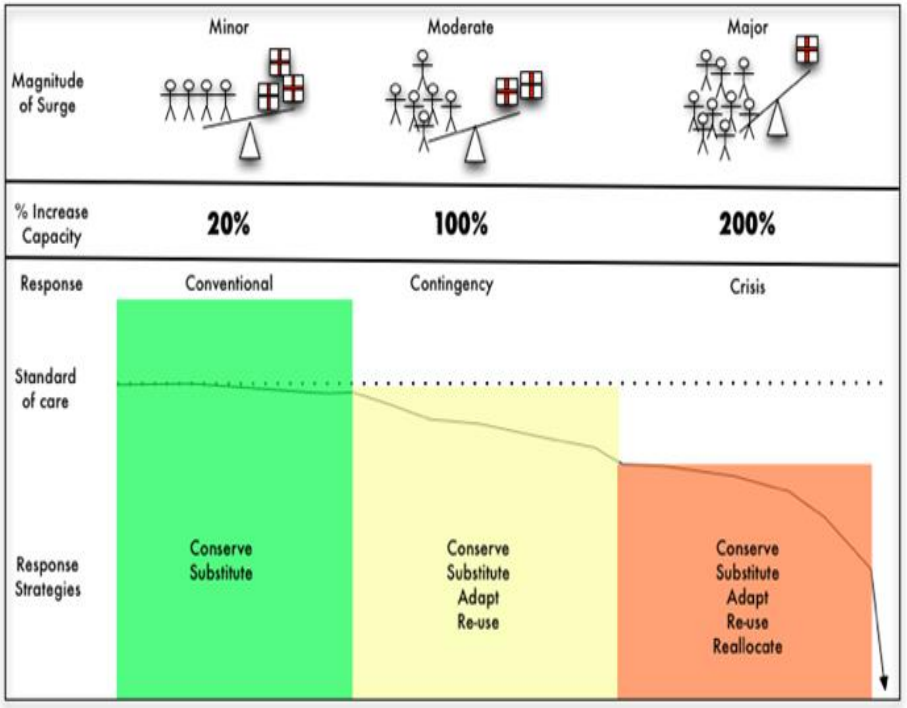



Decreasing ← Morbidity and Incident demands → Increasing

| | Conventional | Contingency | Crisis |
|---|---|---|---|
| Space | Usual patient care spaces maximized | Patient care areas re-purposed (PACU, monitored units for ICU-level care) | Non-traditional areas used for critical care or facility damage does not permit usual critical care |
| Staff | Additional staff called in as needed | Staff extension (supervision of larger number of patients, changes in responsibilities, documentation, etc') | Insufficient ICU trained staff available/unable to care for volume of patients, care team model required & expanded scope |
| Supplies | Cached/on-hand supplies | Conservation, adaptation and substitution of supplies with selected re-use of supplies when safe | Critical supplies lacking, possible allocation/reallocation or lifesaving resources |
| Standard of care | Usual care | Minimal impact on usual patient care practices | Not consistent with usual standards of care (Mass Critical Care) |
| ICU expansion goal | X 1.2 usual capacity (20%) | X 2 usual capacity (100%) | X 3 usual capacity (200%) |
| Resources | Local | Regional/State | National |

Normal ← Operating Conditions → Extreme

# Surge Capacity Logistics

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Sharon Einav, MD; John L. Hick, MD; Dan Hanfling, MD; Brian L. Erstad, PharmD; Eric S. Toner, MD; Richard D. Branson, MSc, RRT; Robert K. Kanter, MD; Niranjan Kissoon, MBBS, FRCPC; Jeffrey R. Dichter, MD; Asha V. Devereaux, MD, MPH, FCCP; and Michael D. Christian, MD, FRCPC, FCCP; on behalf of the Task Force Mass Critical Care*

This paper focuses on surge logistics, those elements that provide the capability to deliver mass critical care.

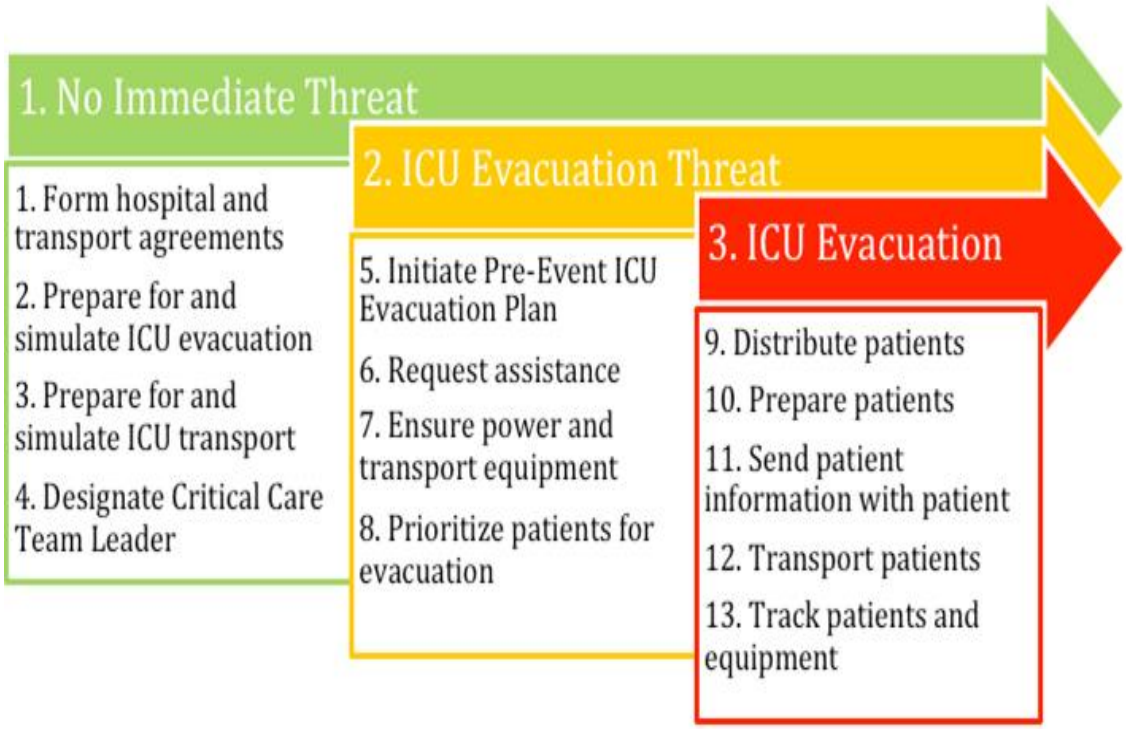
- *Stockpiling of Equipment, Supplies, and Pharmaceuticals*
- *Staff Preparation and Organization*
- *Patient Flow and Distribution*
- *Deployable Critical Care Services*
- *Using Transportation Assets to Support Surge Response*

# Evacuation of the ICU

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Mary A. King, MD, MPH, FCCP; Alexander S. Niven, MD, FCCP; William Beninati, MD; Ray Fang, MD; Sharon Einav, MD; Lewis Rubinson, MD, PhD; Niranjan Kissoon, MBBS, FRCPC; Asha V. Devereaux, MD, MPH, FCCP; Michael D. Christian, MD, FRCPC, FCCP; and Colin K. Grissom, MD, FCCP; on behalf of the Task Force for Mass Critical Care*

- *Evacuation & Transport*
- *Agreements*
- *Simulation Leadership*
- *Planning*
- *Requesting Assistance*
- *Equipment*
- *Patients*
- *Prioritizing*
- *Preparing*
- *Distributing*
- *Information transfer*
- *Transport Methods*
- *Tracking*



# Triage

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

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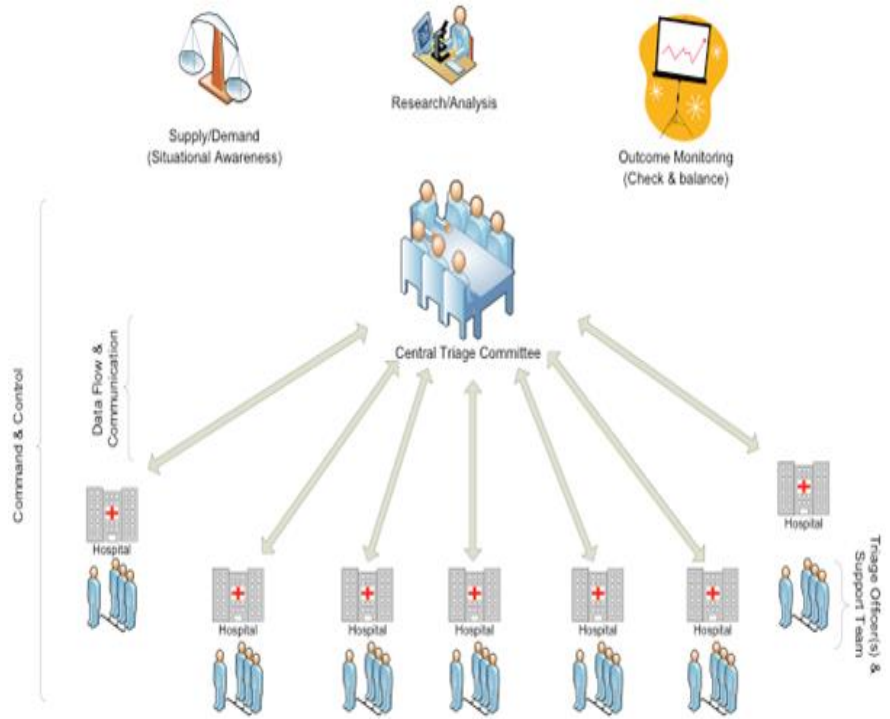


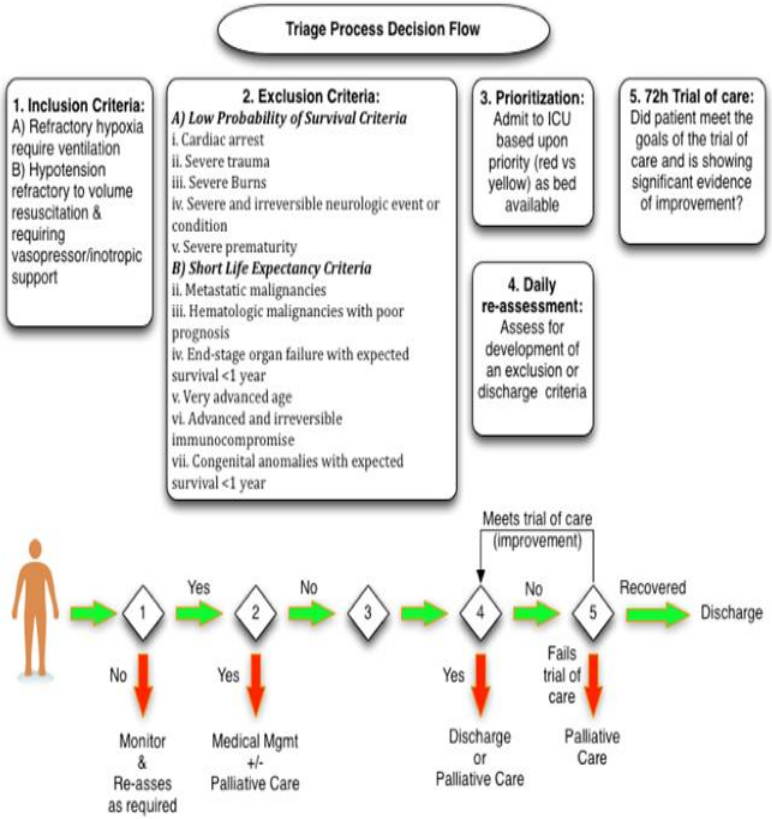

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# Special Populations

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

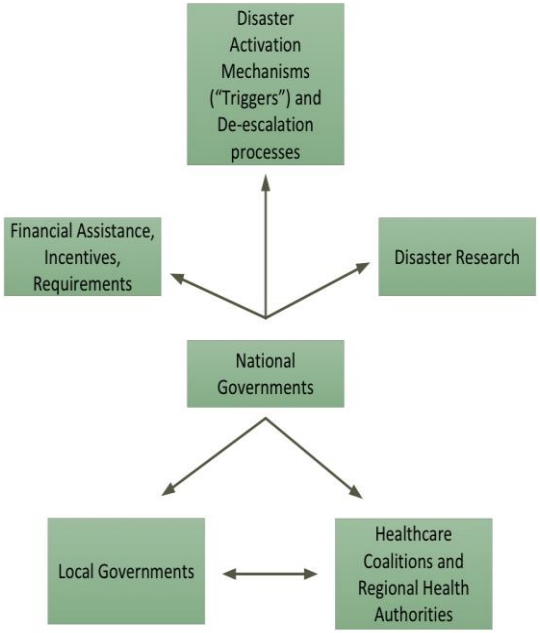
*David Dries, MD, MSE, FCCP; Mary Jane Reed, MD, FCCP; Niranjan Kissoon, MBBS, FRCPC; Michael D. Christian, MD, FRCPC, FCCP; Jeffrey R. Dichter, MD; Asha V. Devereaux, MD, MPH, FCCP; and Jeffrey S. Upperman, MD; on behalf of the Task Force for Mass Critical Care*

- Defining Special Populations for Mass Critical Care
- Planning for Access to Regionalized Service for Special Populations
- Triage and Resource Allocation of Special Populations
- Crisis Standards of Care for Special Populations
- Therapeutic Considerations

# System-Level Planning, Coordination, and Communication

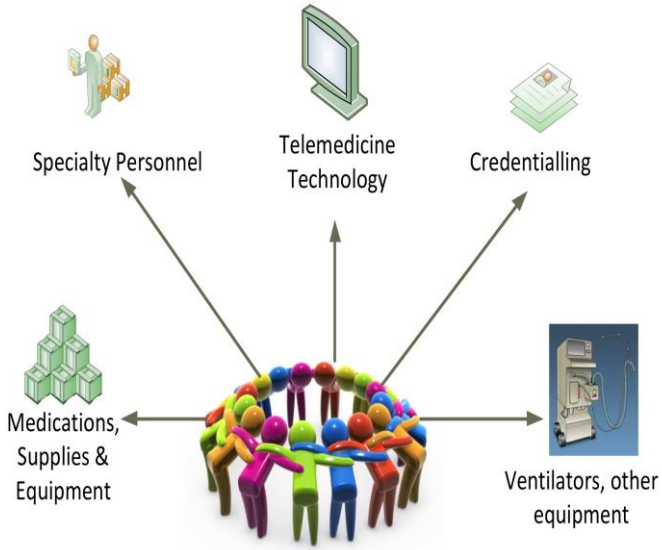
## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Jeffrey R. Dichter, MD; Robert K. Kanter, MD; David Dries, MD; Valerie Luyckx, MD; Matthew L. Lim, MD; John Wilgis, MD; Michael R. Anderson, MD, MBA; Babak Sarani, MD; Nathaniel Hupert, MD; Ryan Mutter, MD; Asha V. Devereaux, MD, MPH, FCCP; Michael D. Christian, MD, FRCPC, FCCP; and Niranjan Kissoon, MBBS, FRCPC; on behalf of the Task Force for Mass Critical Care*




GOVERNMENT


COMMUNICATION



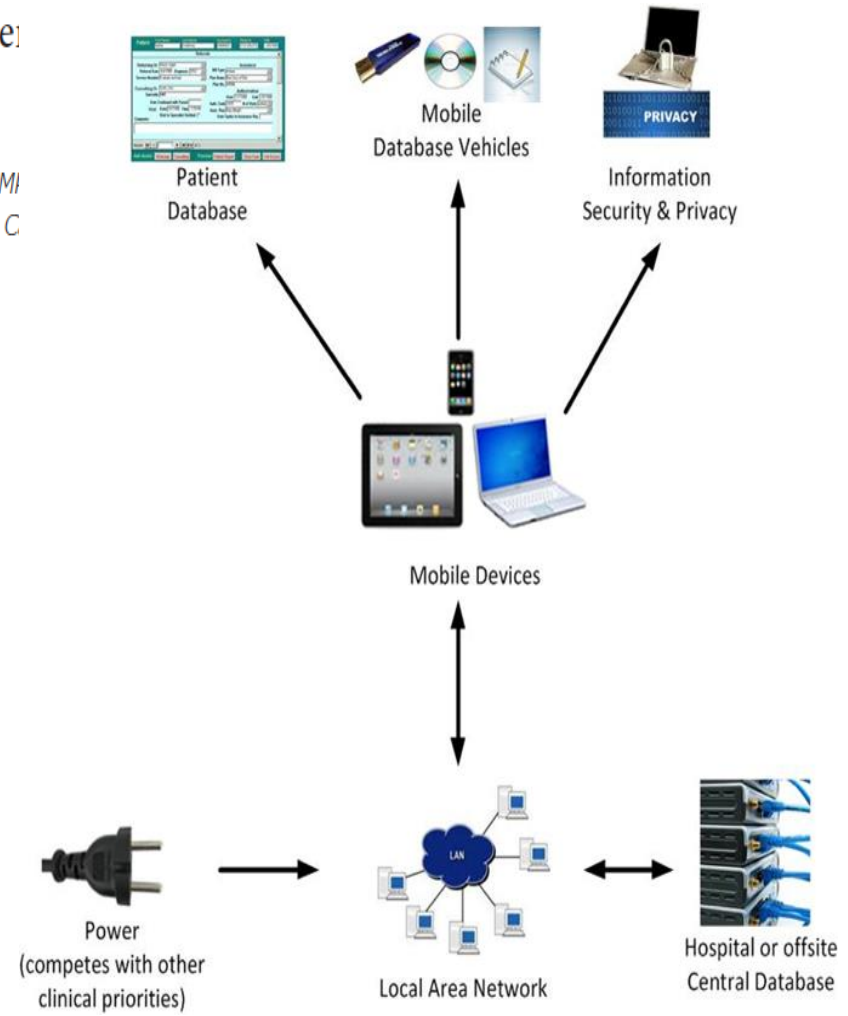

SURGE RESOURCES

# Business and Continuity of Operations

## Care of the Critically Ill and Injured During Pandemics and Disaste
## CHEST Consensus Statement

*Pritish K. Tosh, MD; Henry Feldman, MD; Michael D. Christian, MD, FRCPC, FCCP; Asha V. Devereaux, MD, MI*
*Niranjan Kissoon, MBBS, FRCPC; and Jeffrey R. Dichter, MD; on behalf of the Task Force for Mass Critical C*

- Supply Chain Vulnerabilities in Mass Critical Care
- Health Information Technology Continuity in Disasters
- Hospitals and healthcare information technology preparedness planning

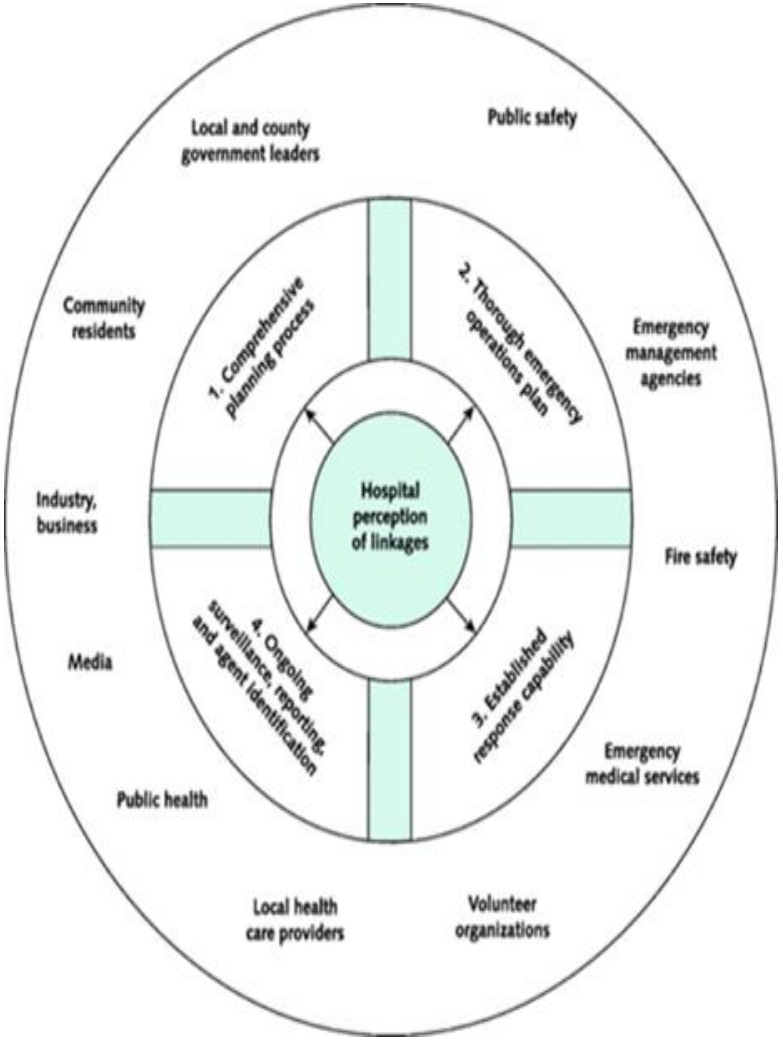


# Engagement and Education

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Asha V. Devereaux, MD, MPH, FCCP; Pritish K. Tosh, MD; John L. Hick, MD; Dan Hanfling, MD; James Geiling, MD, MPH, FCCP; Mary Jane Reed, MD, FCCP; Timothy M. Uyeki, MD, MPH, MPP; Umair A. Shah, MD, MPH; Daniel B. Fagbuyi, MD; Peter Skippen, MBBS; Jeffrey R. Dichter, MD; Niranjan Kissoon, MBBS, FRCPC; Michael D. Christian, MD, FRCPC, FCCP; and Jeffrey S. Upperman, MD; on behalf of the Task Force for Mass Critical Care*

"The following suggestions should assist hospital disaster planners, medical education societies, and public health systems in the engagement of critical care clinicians in ICU disaster preparedness."



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# Legal Preparedness

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Brooke Courtney, JD, MPH; James G. Hodge Jr, JD, LLM; Eric S. Toner, MD; Beth E. Roxland, JD, MBioethics; Matthew S. Penn, JD, MLIS; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; Niranjan Kissoon, MBBS, FRCPC; Michael D. Christian, MD, FRCPC, FCCP; and Tia Powell, MD; on behalf of the Task Force for Mass Critical Care*

- Mass Critical Care plans
- Evacuation, Resource Allocation, Multi-jurisdictions
- Activation of plans
- Legal protections for HCWs during disasters
- Licensing, credentialing & scope of practice

# Ethical Considerations

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Lee Daugherty Biddison, MD, MPH; Kenneth A. Berkowitz, MD, FCCP; Brooke Courtney, JD, MPH; COL Marla J. De Jong, PhD, RN [USAF]; Asha V. Devereaux, MD, MPH, FCCP; Niranjan Kissoon, MBBS, FRCPC; Beth E. Roxland, JD, MBioethics; Charles L. Sprung, MD; Jeffrey R. Dichter, MD; Michael D. Christian, MD, FRCPC, FCCP; and Tia Powell, MD; on behalf of the Task Force for Mass Critical Care*


- Triage and Allocation
- Responding to Ethical Concerns of Patients and Families
- Responsibilities to Providers
- Conduct of Research
- International Disaster Response

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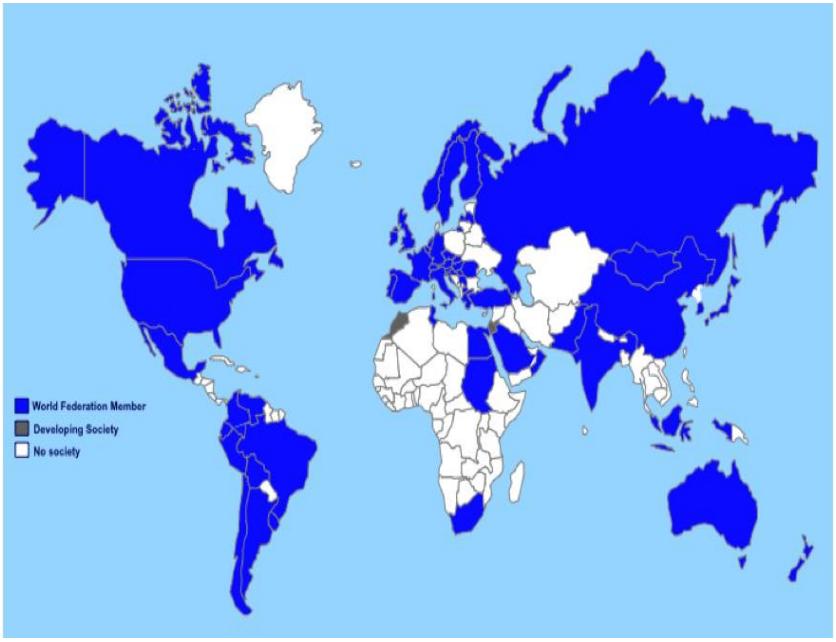
# Resource-Poor Settings: Infrastructure and Capacity Building

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

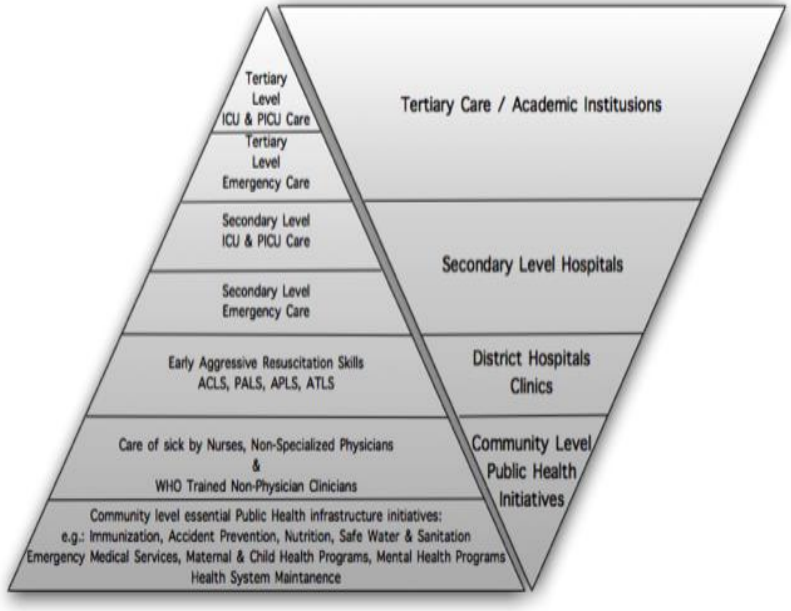
*James Geiling, MD, MPH, FCCP; Frederick M. Burkle Jr, MD, MPH; Dennis Amundson, DO, FCCP; Guillermo Dominguez-Cherit, MD; Charles D. Gomersall, MBBS; Matthew L. Lim, MD; Valerie Luyckx, MD; Babak Sarani, MD; Timothy M. Uyeki, MD, MPH, MPP; T. Eoin West, MD, MPH, FCCP; Michael D. Christian, MD, FRCPC, FCCP; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; and Niranjan Kissoon, MBBS, FRCPC; on behalf of the Task Force for Mass Critical Care*



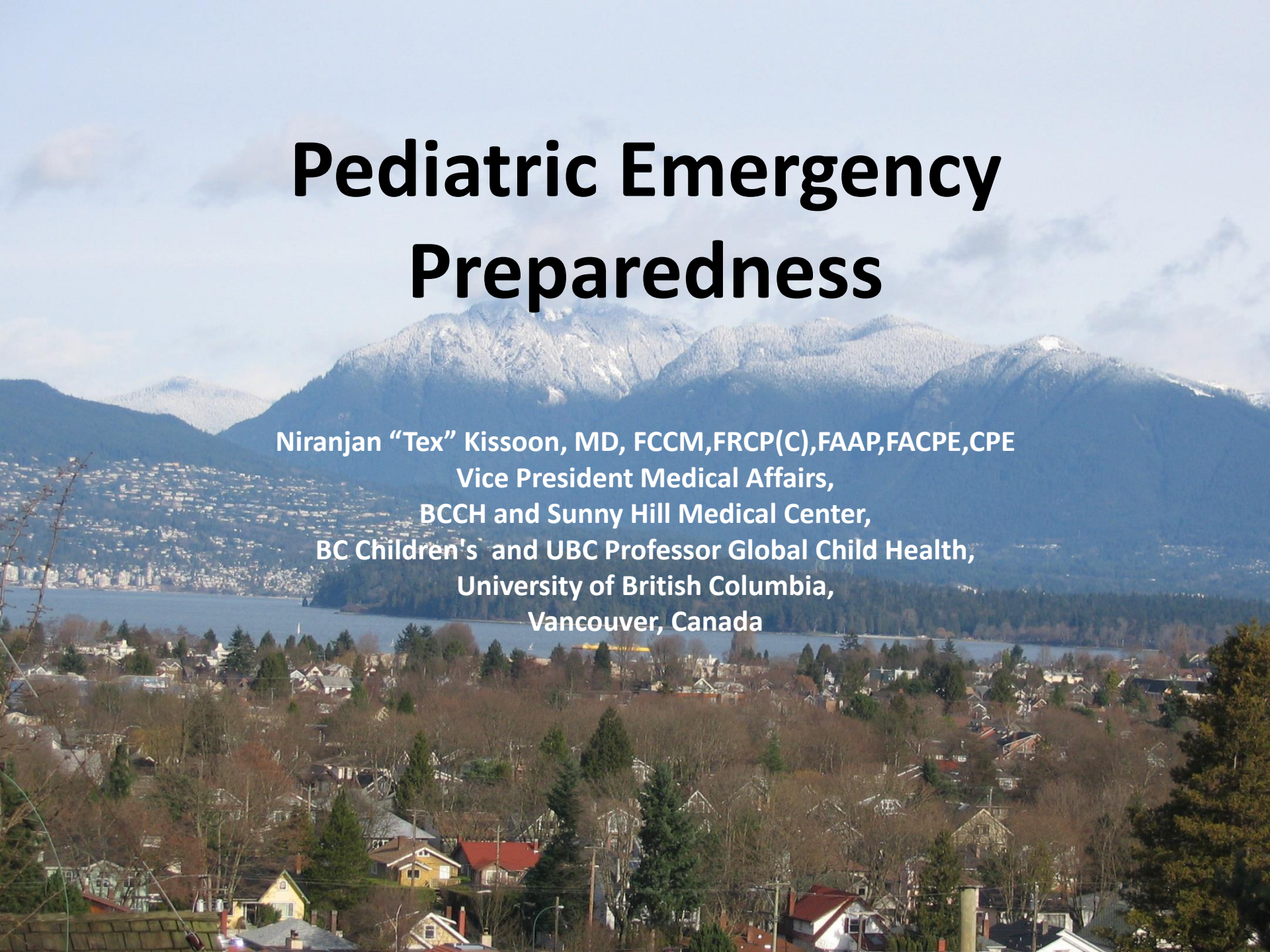

# Resource-Poor Settings: Response, Recovery, and Research

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*James Geiling, MD, MPH, FCCP; Frederick M. Burkle Jr, MD, MPH; T. Eoin West, MD, MPH, FCCP; Timothy M. Uyeki, MD, MPH, MPP; Dennis Amundson, DO, FCCP; Guillermo Dominguez-Cherit, MD; Charles D. Gomersall, MBBS; Matthew L. Lim, MD; Valerie Luyckx, MD; Babak Sarani, MD; Michael D. Christian, MD, FRCPC, FCCP; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; and Niranjan Kissoon, MBBS, FRCPC; on behalf of the Task Force for Mass Critical Care*



# Pediatric Emergency Preparedness



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# Disclosures

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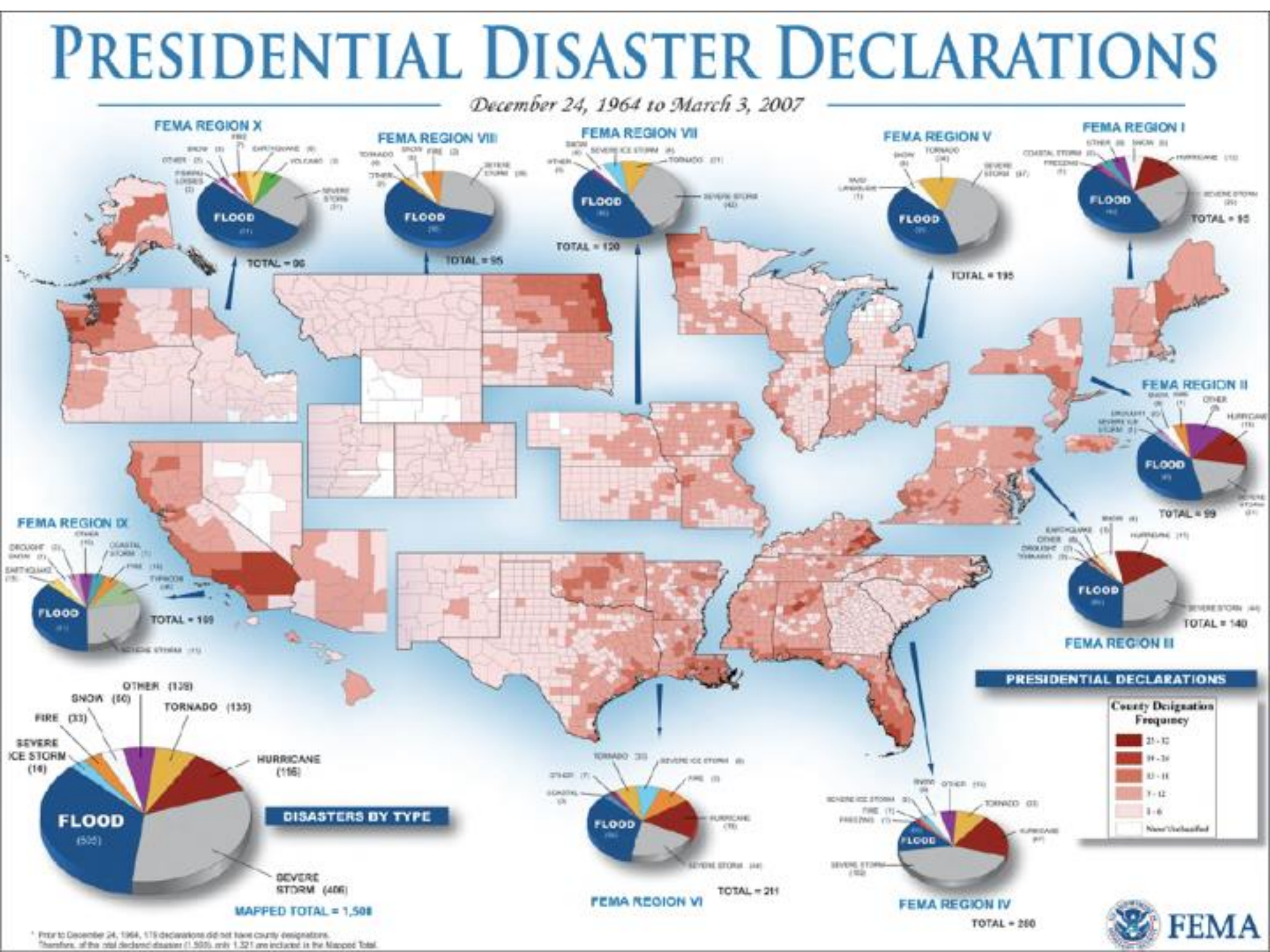
- **The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry**

# Pediatric Emergency Preparedness

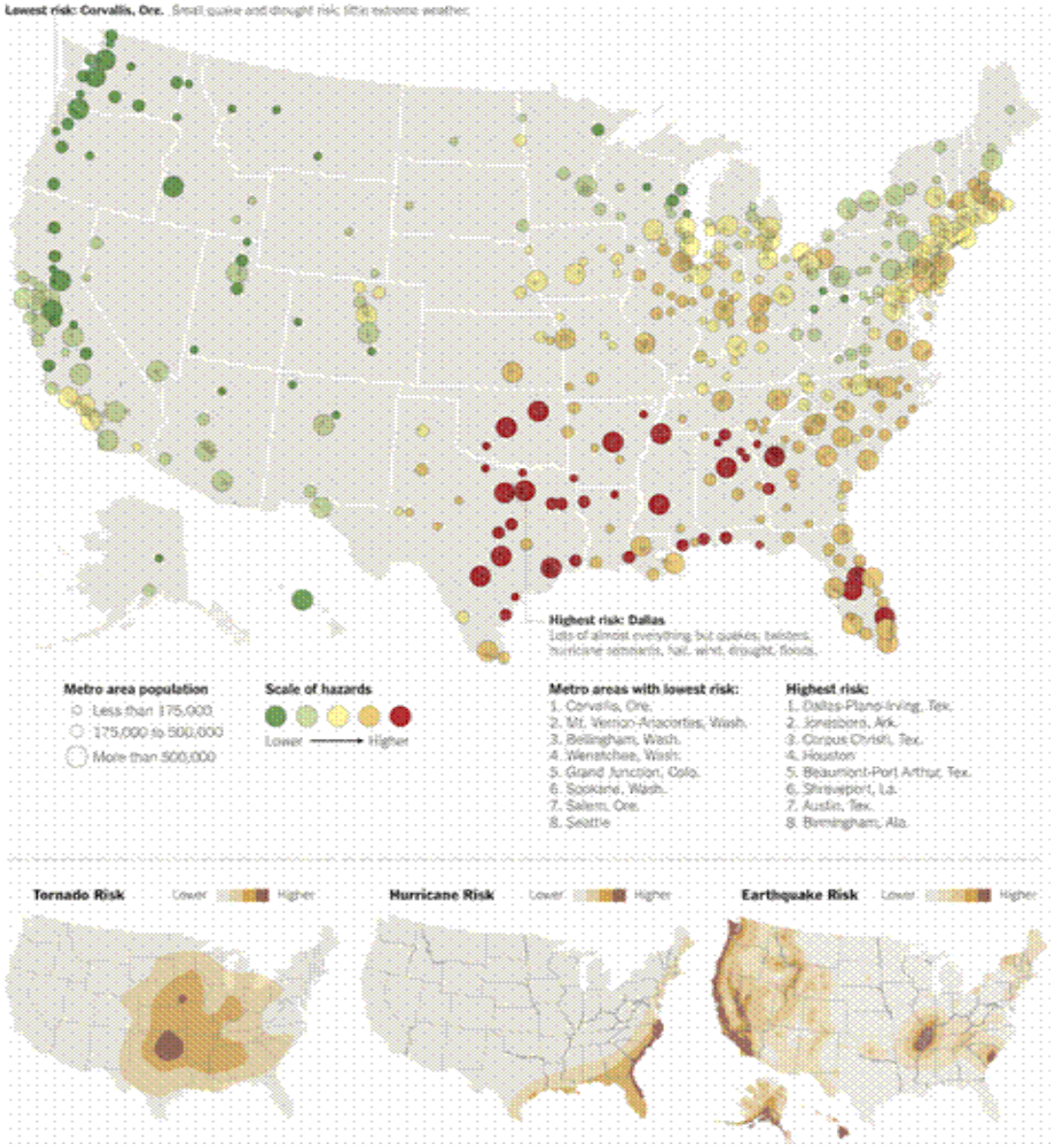
- **Is the threat real? Worth the effort?**
- **Challenges**
- **Planning & Preparedness**
  - **PCCM**
  - **IOM**
  - **ACCP**

# PRESIDENTIAL DISASTER DECLARATIONS

*December 24, 1964 to March 3, 2007*




* Prior to December 24, 1964, 178 declarations did not have county designations. Therefore, of the total declared disasters (1,508), only 1,321 are included in the Mapped Total.


**Lowest risk: Corvallis, Ore.** Small quake and drought risk; little extreme weather.
**Highest risk: Dallas**
Lots of almost everything but quakes; blizzard, hurricane storwards, hail, wind, drought, floods.
**Metro area population**
Less than 175,000
175,000 to 500,000
More than 500,000
**Scale of hazards**
Lower → Higher
**Metro areas with lowest risk:**
1. Corvallis, Ore.
2. Mt. Vernon-Anacortes, Wash.
3. Bellingham, Wash.
4. Wenatchee, Wash.
5. Grand Junction, Colo.
6. Spokane, Wash.
7. Salem, Ore.
8. Seattle
**Highest risk:**
1. Dallas-Plano-Irving, Tex.
2. Jonesboro, Ark.
3. Corpus Christi, Tex.
4. Houston
5. Beaumont-Port Arthur, Tex.
6. Shreveport, La.
7. Austin, Tex.
8. Birmingham, Ala.
**Tornado Risk** Lower Higher
**Hurricane Risk** Lower Higher
**Earthquake Risk** Lower Higher

# Russia School Siege Ends in Carnage

## Hundreds Die As Troops Battle Hostage Takers

*By Peter Baker and Susan B. Glasser*
Washington Post Foreign Service
Saturday, September 4, 2004; Page A01

BESLAN, Russia, Sept. 4 -- Hundreds of children, their parents and teachers died in the bloody culmination of a 52-hour siege that began when heavily armed Muslim guerrillas stormed their school Wednesday and ended in an hours-long battle with Russian troops Friday.

The battered, burned and scorched survivors of Beslan's School No. 1, many of them half-naked children, filled the region's hospitals as troops continued to fight through the afternoon with guerrillas holed up inside the school. Twenty-seven of the fighters, described as Chechens, Russians, Ingush and Arabs, were killed, and at least three were captured, officials said.

Only by late Friday did the scale of the bloodshed in this small town in the region of North Ossetia, west of war-torn Chechnya, become clear. A top Russian official admitted what anguished relatives had been saying for days: There had been more than 1,000 hostages inside the school, the majority of them child

Between 500 and 700 injured former hostages were hospitalized Friday, more than 300 of them children

enlarge photo

A boy runs for cover after being released from School No. 1 during the battle between Russian forces and the guerrillas who had seized the building. (Sergei Karpukhin -- Reuters)

More From The Post

- 'All of a Sudden, the Big Bomb Blew Up' (The Washington Post, Sep 4, 2004)
- Putin's Silence on Crisis Underscores Chilling Trend (The

**Muslim Guerrillas Storm School in Russia – 300 Children Injured**

# Worth the effort?

- **Only 6% of emergency departments have all of the supplies for managing pediatric emergencies.**
- **Only half of hospitals have at least 85% of those critical supplies.**
- **Pediatric emergency care skills deteriorate quickly without practice, yet training is limited**
- **Disaster preparedness plans often overlook the needs of children *even though their needs differ from those of adults.***

IOM Report: "Emergency Care for Children: Growing Pains" 2006

# Worth the effort?

- **3748 EMS agencies contacted**
- **73% written response plan to mass casualty event**
- **13% had pediatric specific plan**
- **69% no plan for school based event**
- **19% pediatric specific triage plan**
- **12% had a pediatrician involved in local medical control**
- **69% had participated in local or regional disaster drills, only 49% included children**

Shirm S et al, Pediatrics 2007

# A thing of the past ?

# Pediatric Emergency Preparedness

- **Is the threat real? Worth the effort?**
- **<u>Challenges</u>**
- **Planning & Preparedness**
  - **PCCM**
  - **IOM**
  - **ACCP**

# Pediatric-specific Care

- Under normal circumstances, survival is better when children with high risk, complex conditions receive care in a pediatric hospital
- Teams of pediatric specialists, volume-quality
  - PICU
    - Pollack, et al; Crit Care Med 1991;19:150
    - Tilford, et al; Crit Care Med 2000;106:289
    - Ruttiman et al; Pediatr Crit Care Med 2000;1:133
  - NICU
    - Phibbs, et al; N Engl J Med 2007;356:2165
    - Goodman, et al; N Engl J Med 2002;346:1538
  - Trauma
    - Osler, et al; J Trauma 2001;50:96
    - Densmore, et al; J Pediatr Surg 2006;41:92

# Pediatric Disaster Preparedness Challenges

- **Vulnerability of children**
  - **Biological (airway, dehydration, immunological, radiation, etc)**
  - **Behavioral**
  - **Emotional**
  - **Intentional targeting**
  - **Socioeconomic**
  - **Legal**
- **Care specific for anatomic & physiologic maturation**
- **Deficiencies in each of the "Four s's" (Space, stuff, staff, system) for children**

**Ballet Class during the SARS epidemic 2003**

**What is the message?**

**A young boy runs in front of a group of security guards wearing masks to protect against the SARS virus as they patrol in Beijing's Wangfujing shopping street. (Associated Press, May 9, 2003)**

# Pediatric Disaster Preparedness Challenges

**“Emergency departments and emergency medical services systems that are unable to meet everyday pediatric care challenges are unlikely to be prepared to deliver quality pediatric care in a disaster.”**

# Pediatric Disaster Preparedness Challenges – Scarce Resources

- Prehospital EMS- No pediatric specialists
- Hospital emergency departments
  - Almost 90% of every-day pediatric emergency visits are to a nonpediatric ED (half of EDs <10 children/day).
    - Gausche-Hill, et al; Pediatrics 2007;120:1299
- Hospital inpatient
  - NY State <20% of hospital vacancies for disaster surge would be suitable for care of children.
  - Pediatric beds are clustered at a minority of hospitals.
    - Kanter, et al; Ann Emerg Med 2007;50:314

# Pediatric Disaster Preparedness Challenges – Scarce Resources

- **Critical care**
  - **PICU beds account for <20% of all ICU beds in US.**
  - **The PICU beds are clustered at a small number of hospitals.**
    - **Randolph, et al; J Pediatrics 2004;144:792**
    - **Wunsch, et al; Crit Care Med 2008;36:2787**
- **Regionalization for everyday circumstances**
  - **Common low risk conditions – community hospital**
  - **High risk, complex conditions – pediatric hospital**
    - **AAP, SCCM; Crit Care Med 2000;28:236-9**

# Pediatric Disaster Preparedness Challenges – Lack of Data

- **Regional and state information systems must be developed to track critical care needs and resources in real time.**
- **Establish real-time rapid analyses**
  - ***to characterize clinical syndromes, age-specific differences, risk factors for severe disease, clinical complications - which require resources***
- **Rapid feedback mechanisms to inform about clinical findings and effective therapies.**

# Pediatric Disaster Preparedness Challenges – Lack of Research

- **Cinical trials of drugs for all ages including premature infants (safety issues, dosing and metabolism issues).**

- **Pediatric clinical research networks that can be "turned on" - pre-approved protocols.**

- **Consent issues for children in clinical research, include indigenous, minority, underserved, lower SES, and culturally and language appropriate issues.**

# Pediatric Emergency Preparedness

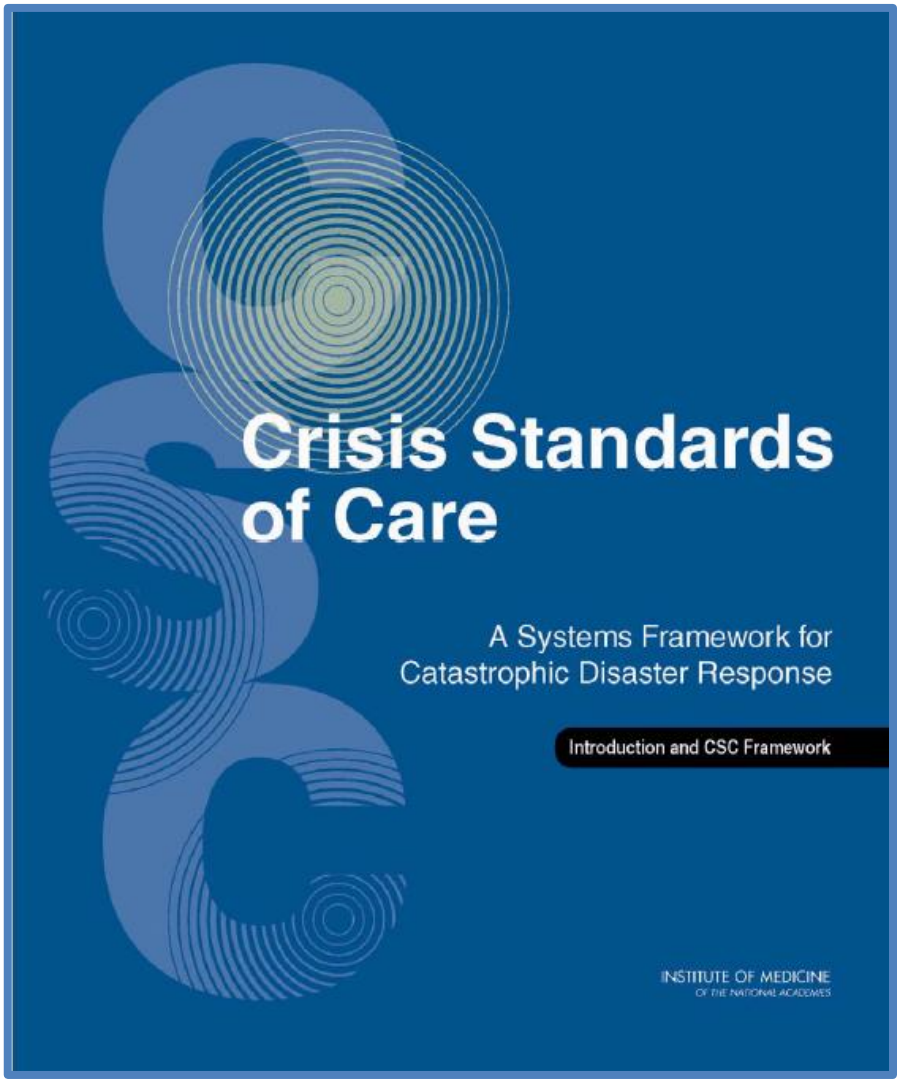
- Is the threat real? Worth the effort?
- Challenges
- Planning & Preparedness
  - PCCM
  - IOM
  - ACCP

# Reflections on Planning

*"In preparing for battle I have found that plans are useless, but planning is indispensable"*

**Dwight Eisenhower 1890-1969**

# Planning & Preparedness


CHEST
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of CHEST PHYSICIANS

**Chest. 2014;146(4_suppl):1S-41S, e1S-e177S**

[ Evidence-Based Medicine ]

CHEST

# Introduction and Executive Summary

## Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

*Michael D. Christian, MD, FRCPC, FCCP; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; Lewis Rubinson, MD, PhD; and Niranjan Kissoon, MBBS, FRCPC; on behalf of the Task Force for Mass Critical Care*

PODCAST

CHEST
AMERICAN COLLEGE of CHEST PHYSICIANS

# Children and Disasters


**Niranjan "Tex" Kissoon, MBBS, FRCPC**

***on behalf of***

**The Task Force For Mass Critical Care**


# Surge Capacity Principles

- **9a: We suggest regional planning include the expectation that the hospital be able to provide initial stabilization care to unique populations that they may not normally serve such as pediatrics, burn and trauma patients.**

- **9b: We suggest access to regional expertise for care of all patients who require specialty critical care services including participation in the planning phase and access to just-in-time consultation for care coordination during a response.**

# Surge Capacity Logistics

- 5: We suggest regional and hospital stockpiles include equipment, supplies, and pharmaceuticals that can be used to accommodate the needs of unique populations that are likely to require critical care in centers other than specialty care centers, including pediatric, burn, and trauma patients.
- 12 Should expert consultation (eg, pediatrics, trauma, burn, or critical care) not be available locally, we suggest every effort be made by hospitals to ensure that such expertise be provided at a minimum through remote consultation.
- 13: We suggest hospitals consider the utilization of technology (e.g., telemedicine) as an important adjunct to the delivery of critical care services in a disaster, to serve as a force multiplier to support response to disaster events. Where no such systems are currently in place, development of a telemedicine or other electronic platform to support patient care delivery is suggested.

# Evacuation of the ICU

- **3b. We suggest pre-identifying unique transport resources that are required for movement of specific populations such as critically ill neonates, children, and technology-dependent patients at a regional level. This information can then be used in real time to match allocated resources to patients.**
- **7b. We suggest availability of adequate portable, energy and medical gas flexible ventilators that can provide accurate small tidal volumes or pressure limits for the premature and neonatal patients expected at designated hospitals (for instance pediatric centers or hospitals with a NICU). Special consideration should be given to creating a standard quickly accessible regional stockpile of mechanical ventilators for evacuation of neonatal patients as it may not be feasible for some non-pediatric centers to have adequate numbers of portable, energy and gas flexible neonatal ventilators.**

# Triage

- **Triage Officers: 7c. We suggest in trauma or burn disasters, triage be carried out by triage officers who are senior surgeons/physicians with experience in trauma, burns, or critical care and experience in care of the age group of the patient being triaged.**
- **Triage Process: 11a: We suggest tertiary care triage protocols for use during a disaster that overwhelms or threatens to overwhelm resources be developed with inclusion and exclusion criteria.**

**TABLE 3** ] Age-Based BP Parameters for Defining Hypotension

| Group | Age | BP Parameter | Value |
|---|---|---|---|
| Adult | >10 y | SBP | <90 |
| Child | 1-10 y | SBP | <[70 + (2 × age in y)] |
| Infant | 1 mo-1 y | SBP | <70 |
| Neonate | Term newborn-1 mo | SBP | <60 |
| Premature neonate | Preterm newborn | MAP | <Gestational age in wk |

MAP = mean arterial pressure. See Table 2 legend for expansion of other abbreviation.

# Triage con't

- **Triage Process: 11c. We suggest patients who will have such a low probability of survival that significant benefit is unlikely be excluded from ICUs when resources are overwhelmed.**
- **11d. We suggest consideration be given to excluding patient groups that have a life expectancy <1 year.**

**TABLE 5** | Short Life Expectancy Exclusion Criteria

| Patient Condition | Age Group |
|---|---|
| Metastatic malignancies | Adult and pediatric |
| Hematologic malignancies with poor prognosis | Adult and pediatric |
| End-stage organ failure with expected survival < 1 y, such as end-stage cardiac failure (NYHA class IV), severe chronic lung disease, advanced hepatic failure (MELD score > 20) | Adult and pediatric |
| Very advanced age | Adult |
| Advanced and irreversibly immunocompromised, such as drug-resistant AIDS | Adult and pediatric |
| Congenital anomalies with expected survival < 1 y | Pediatric |

MELD = Model for End-Stage Liver Disease; NYHA = New York Heart Association.

# Special Populations

- **1. We suggest the definition of special populations for mass critical care be those patients that may be at increased risk for morbidity and mortality outside a fully functional critical care environment or those patients that present unique challenges to providers when a full complement of supportive services is not available. We include the chronically ill and technologically dependent as the fragility of their baseline health puts them at significant risk for progression to a higher level of medical need.**

***Our definition of special populations does not include the general pediatric population because they are a core component of all communities impacted by disasters and pandemics in proportion to their presence in the local population. However, children who have special needs and are technologically dependent are included here.***

# System Level Planning, Coordination, and Communication

- 2e Healthcare coalition/regional health authority Identify clinical experts to oversee and address the needs of specific populations, especially pediatrics, and also specialty populations such as trauma, burns, oncologic, etc.
- 4c We suggest healthcare coalitions/regional health authorities should have the ability to track the number of available ICU capable personnel ("force multipliers") and other designated specialist "resources" (e.g. pediatric and special populations) through their partner hospitals. Partners with telemedicine capability (such as tele-ICU's) should have plans for how to utilize this resource to optimize the use of pediatric and specialty expertise across hospitals served by the telemedicine resource.

# System Level Planning, Coordination, and Communication con't

- 5a We suggest HC/RHA have identified, and be familiar with, the following pediatric disaster/pandemic designated resources including, but not limited to:
  - Pediatric consultative specialists available by dedicated phone line support and/or dedicated video or telemedicine consultation.
  - Designated pediatric surge personnel (e.g., pediatric hospitalists, others) available to non-pediatric hospitals and health systems to support surge in contingency or crisis level events, with a defined plan for how to activate this resource when needed.
  - Identified pediatric capable transport resources for allocation and matching of pediatric patients to available HC/RHA pediatric resources.
  - Knowledge of available key supplies, medications, and other pediatric assets; location of these assets with a defined process for how they may be accessed urgently; and ability to monitor when asset reserves fall below a defined critical threshold.
  - Pediatric educational resources. If web-based, they should be found on HC/RHA websites, or with links to appropriate resources. If published, resources should be readily available to all partners.

# LESSONS LEARNED FROM THE 2013-2015 EVD OUTBREAK:

# Implications For Hospital/ Critical Care Preparedness and Response

**Lewis Rubinson MD, PhD**
**Director, Critical Care Resuscitation Unit**
**R Adams Cowley Shock Trauma Center**
**Associate Professor of Medicine**
**University of Maryland Medical Center**

# RELEVANT DISCLAIMERS AND DISCLOSURES

- I was a World Health Organization consultant clinician in Sierra Leone. This talk has not been approved by the WHO and should not be considered to express any official policies or information releases. The details and opinions expressed are only my own.
- I am a subcontractor to ICF international for an Ebola preparedness effort for the US DHHS Office of the Assistant Secretary for Preparedness and Response
- I am the Site PI for a US DHHS FDA/BARDA contract for the United States Critical Illness and Injury Trials Group Program in Emergency Preparedness
- Scientific Advisory Board member for GlaxoSmithKLine and Phillips/Respironics
- The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry

**EVD as with numerous transmissible illnesses causes severe organ dysfunction-**

**Critical care will be needed for many patients**

# ORGAN DYSFUNCTION AND DEATH

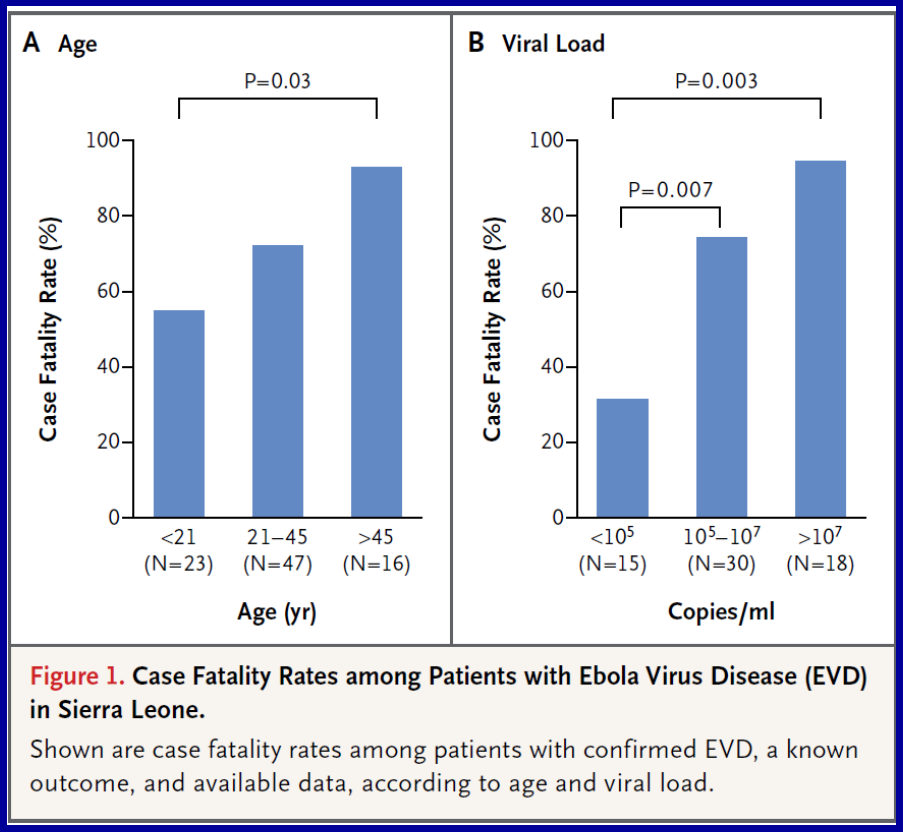
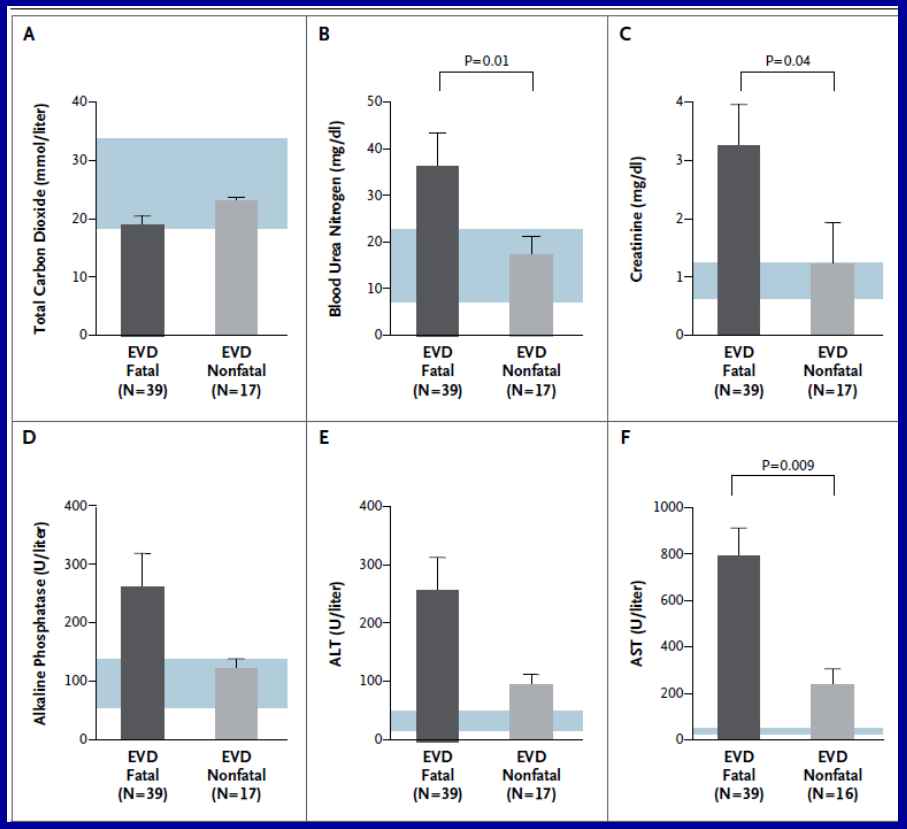



**Figure 1. Case Fatality Rates among Patients with Ebola Virus Disease (EVD) in Sierra Leone.**

Shown are case fatality rates among patients with confirmed EVD, a known outcome, and available data, according to age and viral load.




Schieffelin JS et al. ***N Engl J Med*** 2014 epub.

# EVD and CRITICAL ILLNESS

- Actual incidence of organ dysfunction in West Africa poorly described
- Suggestion that if supportive care started late---MOSD—high risk of death
  - 21% mortality rate in US/ Europe
- Efficacy of disease-specific therapeutics uncertain at forestalling or treating critical illness of EVD

- Treatment sites must be able to provide critical care support for any EVD patient
- Given risk of transmission to other pts and HCWs, delivery of critical care may have to be modified
  - Who makes decision?
  - Who is at risk for tough decisions?

# EMERGENCY MASS CRITICAL CARE: NEED A SIMILAR PROCESS FOR EVD

**Consensus collaboration of public health, ethics, and acute care experts to rationally develop a circumscribed set of key supportive care interventions for many rather than maximal care for few in wake of disaster.**

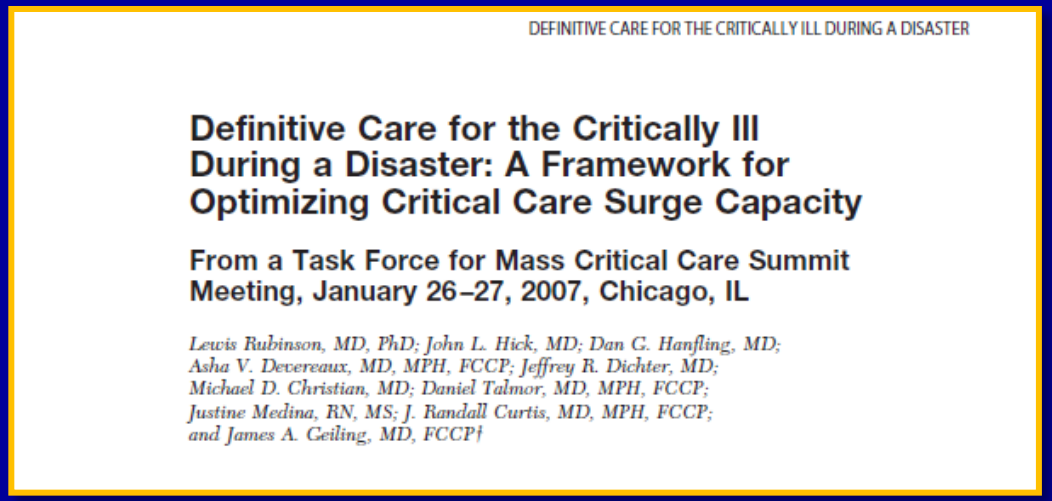
**Criteria such as efficacy/effectiveness, alternatives, resource requirements, preparedness costs were evaluated.**

Augmentation of hospital critical care capacity after bioterrorist attacks or epidemics: Recommendations of the Working Group on Emergency Mass Critical Care

Lewis Rubinson, MD, PhD; Jennifer B. Nuzzo, SM; Daniel S. Talmor, MD, MPH; Tara O'Toole, MD, MPH; Bradley R. Kramer, BS; Thomas V. Inglesby, MD; for the Working Group on Emergency Mass Critical Care

The Working Group on Emergency Mass Critical Care was convened by the Center for Biosecurity of the University of Pittsburgh Medical Center and the Society of Critical Care Medicine to provide recommendations to hospital and clinical leaders regarding the delivery of critical care services in the wake of a bioterrorist attack resulting in hundreds or thousands of critically ill patients. In these conditions, traditional hospital and clinical care standards in general, and critical care standards in particular, likely could no longer be maintained, and clinical guidelines for U.S. hospitals facing these situations have not been developed. The Working Group offers recommendations for this situation. (Crit Care Med 2005; 33[Suppl.]:E2393)

KEY WORDS: bioterrorism; mass casualty medical care; disaster medicine; surge capacity





Definitive Care for the Critically Ill During a Disaster: A Framework for Optimizing Critical Care Surge Capacity

From a Task Force for Mass Critical Care Summit Meeting, January 26–27, 2007, Chicago, IL

*Lewis Rubinson, MD, PhD; John L. Hick, MD; Dan G. Hanfling, MD; Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD; Michael D. Christian, MD; Daniel Talmor, MD, MPH, FCCP; Justine Medina, RN, MS; J. Randall Curtis, MD, MPH, FCCP; and James A. Geiling, MD, FCCP†*

# RUBINSON'S PRINCIPLES (= OPINIONS) FOR EVD CARE

1. Minimization of numbers of people in patient's room
2. Minimization of exposure
   a) ? Role of routine exam and assessments
   b) Balancing patient needs with staff safety
3. Limited organ support reasonable but many interventions/ diagnostics will put staff, institution at high risk
4. There should be no emergencies
5. Procedures should be pre-briefed, choreographed and done by experienced, team-players
   a) PACE
6. Novel therapeutics should be used in clinical trial if possible

**The Devil is in the Details:**

**System Level Planning, Coordination and Communication must include acute care specialists**

# GENERAL ISOLATION STRATEGIES

- **Pt is cared for in dedicated space and not moved (except from Emergency Department depending on hospital plan)**

- **Diagnostics- most labs are only using POC tests**
  - **CDC guidance suggests can use general labs but most hospitals will not be doing so**
  - **Limited labs (will vary by equipment and process solutions)**
  - **Bedside ultrasound mainstay of imaging**
    - **Some facilities are using portable diagnostic X-ray as well**
    - **No CT-scan, MR imaging, cath lab, etc for suspected or confirmed EBV at most hospitals**

# POSSIBLE ADVERSE CONSEQUENCES OF PUI PROCESS

**Person travels recently from impacted country**

- **Has neurological signs/symptoms suggestive of acute CVA**

**Do you go immediately to CT scanner for possible TPA admin for CVA?**

**Does the patient go to the interventional radiology (IR) angio suite for a neuro IR procedure if clinically indicated?**

**How do you decide what is best for the patient?**

**How are facility and staff safety factored in?**

**If there is a time sensitive window, what process is in place to optimize outcomes when EBV PCR from LRN cannot be turned around in necessary window?**

**Responsibility of clinician, hospital, Public Health in decision**

# RAPID EBV ASSESSMENT TEAM

**Must be able to rapidly assess likelihood of EBV**

**Risk to patient if delayed diagnosis or treatment**

- **Are there alternatives?**

**Risk to HCWs or facility for proposed evaluation/treatment**

- **CT scan vs procedure**

**Requires immediate activation of multi-disciplinary team**

**Public health, infectious disease/infection control, clinicians, risk management**

**Must have endorsement by hospital leadership to make decision or must make rapid rec and hospital leadership must make timely decision**

**Should be formalized and tested prior to need**

**Potential for transmissibility of EVD to health care workers dramatically reduces surge capacity and capability**

# HOW IS AND WHEN IS EBOLA TRANSMITTED?

- EVD is transmitted from infectious body fluids entering your body (through mucus membranes or skin breaks)
- Sicker people with more symptoms have production of larger volumes of body fluids (emesis, diarrhea) ---typically more infectious
  - Healthcare workers…in US especially ICU workers (intensity of exposure and duration of exposure)
    - 450 HCWs infected as of Oct 2014
- Fomite transmission less likely but depends on ambient conditions
- Airborne transmission unconfirmed but aerosolization with projectile vomiting, therapeutic interventions, flushing of toilet with large infectious burden of stool  all plausible

# Virus culture and reverse-transcription polymerase chain reaction (RT-PCR) results from 54 clinical samples collected from 26 patients with laboratory-confirmed Ebola hemorrhagic fever.

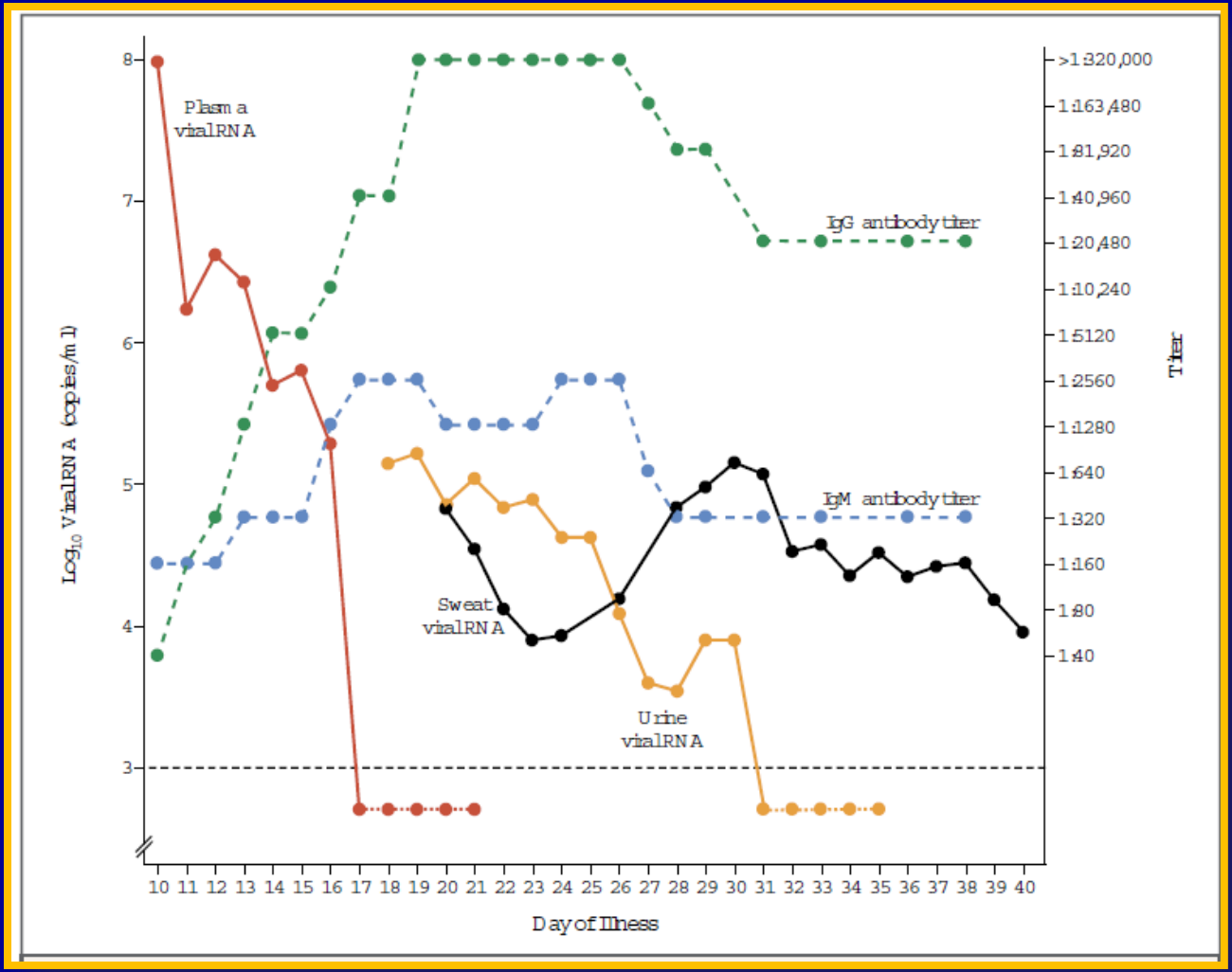
| Sample type, phase of illness | Patients, no. | Samples, no. | Day after disease onset that sample was collected, range (mean) | Virus culture positive, no. (% sample type tested) | RT-PCR positive, no./total tested (%) | Latest day positive after disease onset |
|---|---|---|---|---|---|---|
| Saliva | | | | | | |
| Acute | 10 | 12 | 4–14 (6) | 1 (8) | 8/12 (67) | 8 |
| Convalescent | 4 | 4 | 12–23 (16) | 0 (0) | 0/4 (0) | … |
| Skin[a] | | | | | | |
| Acute | 7 | 8 | 4–10 (7) | 0 (0) | 1/8 (13) | 6 |
| Convalescent | 3 | 3 | 7–15 (12) | 0 (0) | 0/3 (0) | … |
| Urine | | | | | | |
| Acute | 5 | 7 | 5–22 (14) | 0 (0) | 0/7 (0) | … |
| Convalescent | 4 | 4 | 8–40 (28) | 0 (0) | 0/4 | … |
| Vomit | | | | | | |
| Acute | 1 | 1 | NA (9) | 0 (0) | 0/1 (0) | … |
| Convalescent | 1 | 1 | NA (20) | 0 (0) | 0/1 (0) | … |
| Sputum | | | | | | |
| Acute | 1 | 1 | NA (8) | 0 (0) | 0/1 (0) | … |
| Convalescent | 1 | 1 | NA (16) | 0 (0) | 0/1 (0) | … |
| Breast milk | | | | | | |
| Acute | 1 | 1 | NA (7) | 1 (100) | 1/1 (100) | 7 |
| Convalescent | 1 | 1 | NA (15) | 1 (100) | 1/1 (100) | 15 |
| Stool,[b] acute | 4 | 4 | 4–12 (8) | 0 (0) | 2/4 (50) | 12 |
| Sweat,[b] acute | 1 | 1 | NA (9) | 0 (0) | 0/1 (0) | … |
| Tears,[b] acute | 1 | 1 | NA (6) | 0 (0) | 1/1 (100) | 6 |
| Nasal blood,[b] acute | 1 | 1 | NA (10) | 0 (0) | 1/1 (100) | 10 |
| Body louse,[b] acute | 1 | 1 | NA (9) | 0 (0) | 0/1 (0) | … |
| Semen,[c] convalescent | 1 | 2 | 40–45 (43) | 1 (50) | 1/2 (50) | 40 |
| Subtotal acute | 23 | 38 | 4–22 (9) | 2 (5) | 14 (37) | 12 |
| Subtotal convalescent | 8 | 16 | 7–45 (21) | 2 (13) | 2 (13) | 40 |
| Total | 26[d] | 54 | 4–45 (12) | 4 (7) | 16 (30) | … |

**NOTE.** Samples are classified as either acute phase (serum ELISA antigen positive and/or RT-PCR positive) or convalescent phase (previously serum ELISA antigen positive or RT-PCR positive but now reverted to negative, often with the appearance of ELISA IgG antibody). Clinical samples were classified as acute or convalescent phase on the basis of the results of the most closely matched serum sample by date, which was a mean difference of 1.2 days (range, 0–13 days) and 7.3 days (range, 0–29 days) for acute- and convalescent-phase samples, respectively. NA, not applicable.

[a] Samples were swabbed from the hand (10) or forehead (1). The sole positive sample was from a hand.
[b] No convalescent-phase samples were available for this sample type.
[c] No acute-phase sample was available for this sample type.
[d] Both acute- and convalescent-phase samples were collected from some patients.

**Bausch D G et al. J Infect Dis. 2007;196:S142-S147**

# RECENTLY IN GERMANY




Kreuels B et al. A Case of Severe Ebola Virus Infection Complicated by Gram-Negative Septicemia
***N Engl J Med*** 2014

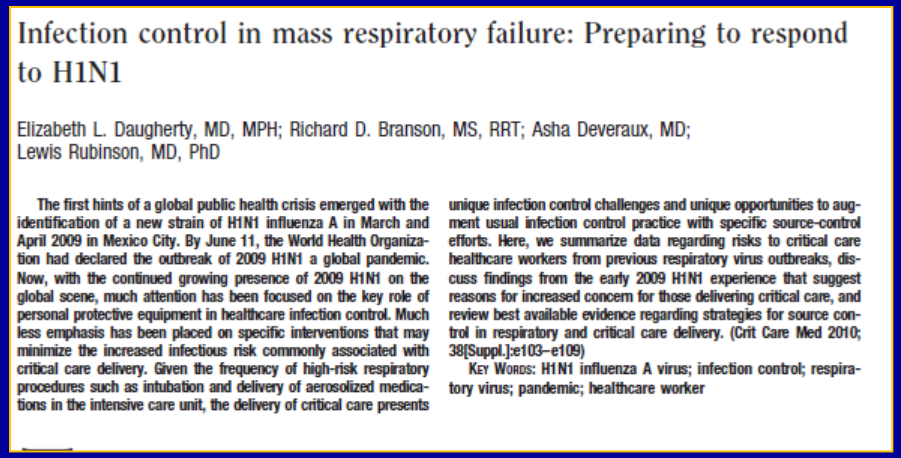
# THE UNCERTAINTY IMPACTS CAPACITY AND CAPABILITY

- **Anecdotally most designated Ebola Treatment Units in US said could manage 1-3 critically ill EVD pts**
  - **My facility could do up to 2 (> 200+ ICU beds)**

- **"Higher" levels of Personal Protective Equipment may reduce quantities of available product, trained staff, or ability to deliver care**

- **Reduced willingness to respond vs other Public Health Emergencies**

# MODERN ORGAN SUPPORT AND TRANSMISSION

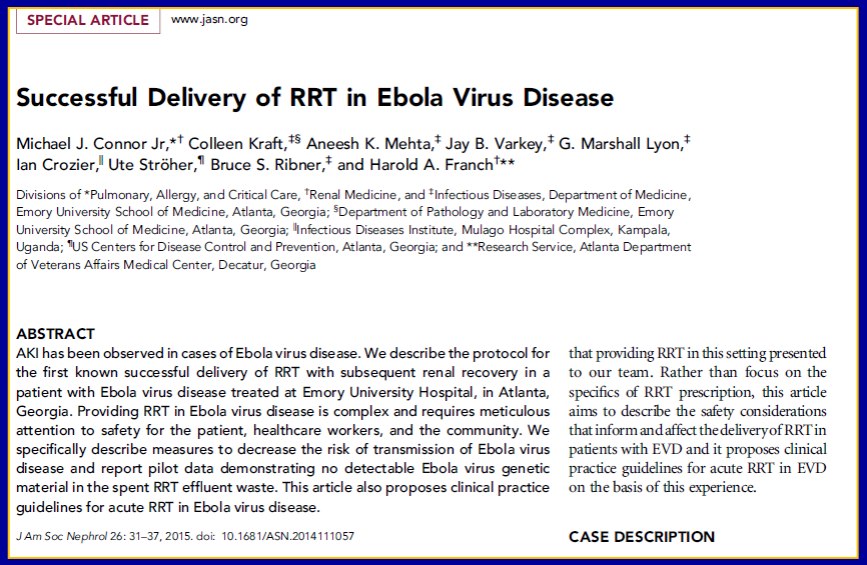


Infection control in mass respiratory failure: Preparing to respond to H1N1

Elizabeth L. Daugherty, MD, MPH; Richard D. Branson, MS, RRT; Asha Deveraux, MD; Lewis Rubinson, MD, PhD

The first hints of a global public health crisis emerged with the identification of a new strain of H1N1 influenza A in March and April 2009 in Mexico City. By June 11, the World Health Organization had declared the outbreak of 2009 H1N1 a global pandemic. Now, with the continued growing presence of 2009 H1N1 on the global scene, much attention has been focused on the key role of personal protective equipment in healthcare infection control. Much less emphasis has been placed on specific interventions that may minimize the increased infectious risk commonly associated with critical care delivery. Given the frequency of high-risk respiratory procedures such as intubation and delivery of aerosolized medications in the intensive care unit, the delivery of critical care presents unique infection control challenges and unique opportunities to augment usual infection control practice with specific source-control efforts. Here, we summarize data regarding risks to critical care healthcare workers from previous respiratory virus outbreaks, discuss findings from the early 2009 H1N1 experience that suggest reasons for increased concern for those delivering critical care, and review best available evidence regarding strategies for source control in respiratory and critical care delivery. (Crit Care Med 2010; 38[Suppl.]:e103–e109)

KEY WORDS: H1N1 influenza A virus; infection control; respiratory virus; pandemic; healthcare worker



SPECIAL ARTICLE www.jasn.org

Successful Delivery of RRT in Ebola Virus Disease

Michael J. Connor Jr,*† Colleen Kraft,‡§ Aneesh K. Mehta,‡ Jay B. Varkey,‡ G. Marshall Lyon,‡ Ian Crozier,‖ Ute Ströher,¶ Bruce S. Ribner,‡ and Harold A. Franch†**

Divisions of *Pulmonary, Allergy, and Critical Care, †Renal Medicine, and ‡Infectious Diseases, Department of Medicine, Emory University School of Medicine, Atlanta, Georgia; §Department of Pathology and Laboratory Medicine, Emory University School of Medicine, Atlanta, Georgia; ‖Infectious Diseases Institute, Mulago Hospital Complex, Kampala, Uganda; ¶US Centers for Disease Control and Prevention, Atlanta, Georgia; and **Research Service, Atlanta Department of Veterans Affairs Medical Center, Decatur, Georgia

ABSTRACT

AKI has been observed in cases of Ebola virus disease. We describe the protocol for the first known successful delivery of RRT with subsequent renal recovery in a patient with Ebola virus disease treated at Emory University Hospital, in Atlanta, Georgia. Providing RRT in Ebola virus disease is complex and requires meticulous attention to safety for the patient, healthcare workers, and the community. We specifically describe measures to decrease the risk of transmission of Ebola virus disease and report pilot data demonstrating no detectable Ebola virus genetic material in the spent RRT effluent waste. This article also proposes clinical practice guidelines for acute RRT in Ebola virus disease.

J Am Soc Nephrol 26: 31–37, 2015. doi: 10.1681/ASN.2014111057

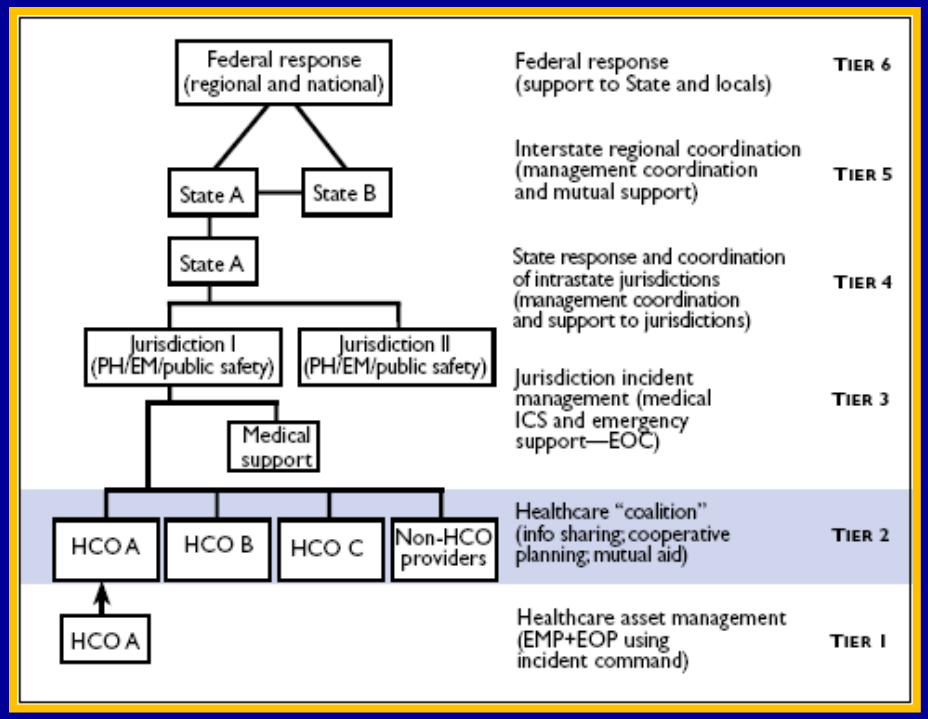
that providing RRT in this setting presented to our team. Rather than focus on the specifics of RRT prescription, this article aims to describe the safety considerations that inform and affect the delivery of RRT in patients with EVD and it proposes clinical practice guidelines for acute RRT in EVD on the basis of this experience.

CASE DESCRIPTION

- **Transmission data in resource-limited environments may not entirely translate for modern means to deliver organ supportive care**
  - **Can patient survive to transmit in respiratory droplets and what is impact of different means to deliver supplemental oxygen (high flow nasal cannula, NIPPV, invasive mechanical vent) on transmission?**

**Resource-intensiveness to prepare and respond for EVD requires regional collaboration**

# REGIONAL COLLABORATIONS




- Cannot control where patients "presents"
- CDC recommended tiers of hospitals
- 5700+ US hospitals, 3000+ with ICUs
  - Cannot control where patients present
  - Can control where patients get definitive care
- ASPR HPP grant to resource Ebola Treatment Units in each HHS region
- Ideally should not be EVD-specific

**Learning during an outbreak (especially clinically) is very challenging.**

# KEY QUESTIONS WHERE FAILURE TO LEARN IS NOT AN OPTION

1. **Can Ebola be transmitted by respiratory droplets or droplet nuclei?**
   a) **Supplemental oxygen**

2. **How early can PCR rule out disease?**
   a) **Previous outbreaks suggested 72 hrs (incredibly difficult and dangerous to operationalize)**

3. **Which supportive care treatment regimens are effective?**

# STRENGTHS AND OPPORTUNITIES FOR LEARNING

## Strengths

- Epidemiology of outbreak
- Viral sequencing
- Vaccine trials

## Opportunities

- Patient level physiologic data
  - Especially when needed to aggregate across multiple facilities
- Disease-specific therapeutic trials
- Supportive care strategies and effectiveness

# UNDERSTANDING THERAPEUTICS IN CRITICALLY ILL PATIENTS

- With high incidence of organ dysfunction (e.g. EVD), safety determination is not much easier than efficacy/ effectiveness.
- Well-defined organ failure measurements, temporal relationships between organ failure and intervention as well as safety data needs to be a rigorous as outcomes data
- Data collection must be done by experienced clinical investigators, but roles must be separate from responding clinicians
- United States Critical Illness and Injury Trials Group Program in Emergency Preparedness (USCIITG-PREP) has novel contract with FDA and BARDA to create infrastructure for rapid data collection, analysis and reporting in midst of public health emergencies
  - Additional CDC grant to promote international North American collaboration
- Working with international collaborators from around the globe to meet rapid learning during public health emergency needs.

# Thank You

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- **Using the Webinar System**
  - **“Click” the Q&A tab at the top left of the webinar tool bar**
  - **“Click” in the white space**
  - **“Type” your question**
  - **“Click” ask**
- **On the Phone**
  - **Press Star (*) 1 to enter in the queue to ask a question**
  - **State your name**
  - **Listen for the operator to call your name**

# Thank you for joining!
# Please email us questions at coca@cdc.gov


**Centers for Disease Control and Prevention**

**Atlanta, Georgia**

http://emergency.cdc.gov/coca

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